P-1573-LL

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2003-045931
(43)Date of publication of application : 14.02.2003

(51)Int.Cl. H01L 21/68
B65G 49/00
G03F 7/20
H01L 21/027

(21)Application number : 2001-230727
(22)Date of filing : 31.07.2001

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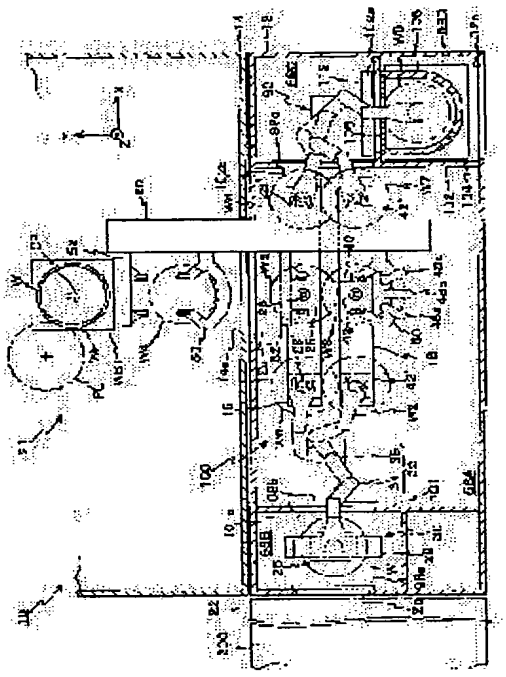
(54) ALIGNER

(57)Abstract:
PROBLEM TO BE SOLVED: To improve throughput when substrates are transported between substrate processing units connected inline.
SOLUTION: A buffer unit 29 can accommodate a plurality of unexposed wafers to be carried in from a C/D 200 and exposed wafers to be returned to a C/D simultaneously. As a result, even if the difference in the throughput occurs between a C/D side (including an inline interface part) and an aligner body 21 side, by simultaneously keeping a plurality of wafers in the buffer unit 29 temporarily, a waiting time, i.e., a loss of time can be eliminated. Thus, the throughput is improved when substrates are transported between the substrate processing units connected inline.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's

decision of rejection]
[Date of extinction of right]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] the body of an aligner including the substrate stage in which it is the aligner connected with a substrate processor with in-line one, and the substrate for exposure is laid, and; — the substrate returned to the substrate carried in from said substrate processor, and said substrate processor — the buffer unit which can be held in several multi-sheet coincidence, and; — the substrate transfer system which conveys a substrate between said buffer units and said substrate stages, and an aligner equipped with;.
[Claim 2] Said buffer unit is an aligner according to claim 1 characterized by separating predetermined spacing for the substrate for said every large number in the vertical direction, and having the multistage shelf which can be held.
[Claim 3] The aligner according to claim 2 characterized by having further the drive which drives said buffer unit in the vertical direction.
[Claim 4] An aligner given in any 1 term of claims 1-3 characterized by having further the conveyance system chamber by which said buffer unit and part of said substrate transfer system are arranged to the interior.
[Claim 5] The aligner according to claim 4 characterized by the interior of said conveyance system chamber consisting of inert gas replaceable while opening for receipts and payments of the substrate conveyed between said substrate processors and said buffer units is prepared in said conveyance system chamber and this opening is opened and closed by the shutter.
[Claim 6] The transport device according to claim 5 characterized by being divided in two or more space where the building envelope of said conveyance system chamber includes the 1st inert-gas-replacement room in which said buffer unit was held, and making said 1st inert-gas-replacement room into positive pressure to said conveyance system chamber exterior.
[Claim 7] The aligner according to claim 4 with which it has further the body chamber by which the interior was permuted with inert gas, and the interior of said conveyance system chamber is characterized by consisting of inert gas replaceable while holding said body of an aligner and remaining parts of said substrate transfer system.
[Claim 8] Said inert-gas-replacement rooms by which the building envelope of said conveyance system chamber is divided at two or more inert-gas-replacement rooms including the 1st inert-gas-replacement room in which said buffer unit was held, and adjoins mutually are the aligner according to claim 7 characterized by being constituted possible [a free passage] through opening which can be opened and closed with a shutter.
[Claim 9] The internal pressure of two or more of said inert-gas-replacement rooms is an aligner according to claim 8 with which the 2nd inert-gas-replacement room which adjoins said body chamber is characterized by being the highest, and said 1st inert-gas-replacement room being the lowest, and being maintained.
[Claim 10] The concentration of the inert gas of two or more of said inert-gas-replacement rooms is an aligner according to claim 8 or 9 with which the 2nd inert-gas-replacement room which adjoins said body chamber is characterized by being the highest, and said 1st inert-gas-replacement room being the lowest, and being maintained.
[Claim 11] The opening area at the time of receipts and payments of a substrate of opening prepared

between the inert-gas-replacement rooms which adjoin mutual [said] is an aligner according to claim 10 characterized by being set up so that opening between the inert-gas-replacement rooms where opening between the inert-gas-replacement rooms contiguous to said 1st inert-gas-replacement room is the smallest, and adjoins said 2nd inert-gas-replacement room may become the largest.
[Claim 12] The aligner according to claim 11 characterized by preparing opening by which the opening area at the time of receipts and payments of a substrate is set to the wall which divides said 1st interior of an inert-gas-replacement room, and the exterior of said conveyance system chamber still smaller.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the aligner which is applied to an aligner, especially is connected to substrate processors, such as a coater developer, with in-line one.
[0002]
[Description of the Prior Art] Conventionally, at the lithography process for manufacturing a semiconductor device etc., aligners, such as so-called stepper, the so-called, so-called scanning stepper, etc., are mainly used, and comparatively many excimer laser, such as KrF excimer laser or ArF excimer laser, has come to be used as the light source for exposure of these aligners in recently. Moreover, in recently, the lithography system which made in-line connection with the coater developer (it is suitably sketched as "C/D" below Coater/Developer:) who develops the wafer after resist spreading of as opposed to a wafer for these aligners and exposure (after a pattern imprint) is becoming in use. At a lithography process, this is for performing a series of above-mentioned processings as efficiently as possible etc. while each processing of resist spreading, exposure, and development is performed as a series of processings and it needs to prevent invasion of the dust into equipment etc. also in which down stream processing.
[0003] the case of the employment which conveys a wafer between C/D and the wafer stage of the body of an aligner with in-line one — conveyance of a wafer — a profile — it was performed by the following procedures.
[0004] It is carried in to the in-line interface load arm (it is hereafter sketched as "in-line I/F and a load arm") installed in the location of C / D side approach in the loader chamber in which most wafer conveyance systems of an aligner were held for the unexposed wafer by the conveyance system through the direct or in-line interface section from the C/D side. And the carried-in wafer is taken out from in-line I/F and a load arm by the robot which constitutes a wafer conveyance system, and is conveyed henceforth to a wafer stage according to a predetermined procedure and a predetermined path by the wafer conveyance system.
[0005] On the other hand, the wafer [finishing / exposure] which exposure ended is conveyed by the wafer conveyance system, and is received and passed to the above-mentioned robot. And it is carried in to an in-line interface unload arm (it is hereafter sketched as "in-line I/F and an unload arm") by the robot. And the wafer [finishing / exposure] carried in to in-line I/F and an unload arm is taken out from in-line I/F and an unload arm by the conveyance system by the side of the in-line interface section, or C/D. In addition, what is passed to in-line I/F and an unload arm from the unload table on which a wafer [finishing / exposure] constitutes a wafer conveyance system is known (refer to international public presentation WO 00/No. 02239 official report).
[0006] In-line I/F and the load arm 130 which is indicated by the above-mentioned international public presentation official report and which is arranged inside an aligner as a contact with an aligner a C/D side (the in-line interface section is included), and in-line I/F and an unload arm 138 are shown to drawing 4 by the side elevation with the robot 132 inside an aligner. In this drawing 4 , a space near side is an in-line interface section side (C/D side), and a space back side is an interior side of an aligner. In-line I/F and the load arm 130 with which the unexposed wafer W is laid in the upper part of in-line I/F and the unload arm 138 in which wafer W' [finishing / exposure] is laid are arranged so that this drawing 4 may also

show.
[0007]
[Problem(s) to be Solved by the Invention] however — since the contact by the side of the in-line interface section (C/D side) was constituted from an above-mentioned conventional technique by one in-line I/F and the load arm 130 each, and in-line I/F and an unload arm 138, respectively, if a difference arises in the conveyance throughput of the wafer from the in-line interface section, and the throughput of an aligner — either — it needed to double with the later one. For this reason, the latency time will arise and that part and a throughput will become late at an equipment [one of] side. Especially in the aligner which performs taking out of the unexposed wafer of in-line I/F and the load arm 130, and carrying in of a wafer [finishing / exposure] to in-line I/F and the unload arm 138 by the same robot arm The throughput by the side of an aligner is higher than the throughput of conveyance of the wafer by the side of in-line one. When a throughput is early Since the wafer [finishing / exposure] which carried out the unload previously on in-line I/F and the unload arm 138 is overdue A wafer [finishing / the next exposure] cannot be passed to in-line I/F and the unload arm 138 from a robot arm. Consequently, the situation where actuation which takes out the following unexposed wafer from in-line I/F and the load arm 130 by the robot arm could not be performed might arise.
[0008] Moreover, when a circuit pattern makes it detailed with high integration of a semiconductor device and the interior of an aligner becomes the inert gas space where purity is high, although a wafer loader chamber also serves as inert gas space, naturally equipments (it is hereafter called "repeating installation") used as an in-line contact mentioned above, such as in-line I/F and the load arm 130, and in-line I/F, an unload arm 138, will be installed in the first inert gas purge space (the so-called load lock chamber). In this case, it loads one wafer at a time (and unload), the inert gas replacement of the load lock chamber in which repeating installation is installed even if the processing speed of the body of an aligner goes up by performing inert gas replacement serves as a failure, and it becomes difficult to raise a throughput.
[0009] This invention was made under this situation, and in case the purpose conveys a substrate between the substrate processors connected with in-line one, it is to offer the aligner which can raise the throughput.
[0010]
[Means for Solving the Problem] Invention according to claim 1 is an aligner connected with a substrate processor (200) with in-line one. The substrate stage (WST) in which the substrate for exposure (W) is laid the body of an aligner (21) to include, and; — the substrate returned to the substrate carried in from said substrate processor, and said substrate processor — the buffer unit (29) which can be held in several multi-sheet coincidence, and; — the substrate transfer system (100) and; which convey a substrate between said buffer units and said substrate stages It is the aligner which it has.
[0011] According to this, a buffer unit can hold the substrate (substrate [finishing / exposure]) returned to the substrate (unexposed substrate) and substrate processor which are carried in from a substrate processor in several multi-sheet coincidence. for this reason — even if a difference arises in a throughput between a substrate processor side and the body side of an aligner (the in-line interface section is included) — coincidence — many — it is able to make it by storing several substrates temporarily to a buffer unit for there to be no loss of the latency time, i.e., time amount. For example, although the direction of the rate at which a substrate [finishing / exposure] is carried in to a buffer unit from the body of an aligner compared with the rate at which a substrate [finishing / a buffer unit to exposure] is taken out at a substrate processor side becomes quick when the throughput by the side of the body of an aligner is higher By holding a substrate [finishing / exposure to a buffer unit] in two or more sheet coincidence, there is no latency time, and by the substrate transfer system, an unexposed substrate can be taken out from a buffer unit and it can carry in to a substrate stage. Therefore, the throughput can be raised in case a substrate is conveyed between the substrate processors connected with in-line one.
[0012] In this case, although it can, of course, also perform considering as the configuration which arranges the configuration of a buffer unit horizontally, namely, stands a substrate, and is held several many sheets, said buffer unit can be supposed that predetermined spacing is separated for the substrate for said every large number in the vertical direction, and it has the multistage shelf (231-236) which can be held like an aligner according to claim 2.

[0013] In this case, it is desirable to enable relative displacement of at least that part containing the attaching part which holds a substrate among substrate transfer systems, and a buffer unit in the vertical direction, for example, it can decide to have further the drive (25) which drives said buffer unit in the vertical direction like an aligner according to claim 3.
[0014] Suppose that it has further the conveyance system chamber (12) by which said buffer unit and part of said substrate transfer system are arranged to the interior like an aligner according to claim 4 in each aligner given in above-mentioned claims 1-3.
[0015] In this case, while opening for receipts and payments of the substrate conveyed between said substrate processors and said buffer units (12b) is prepared in said conveyance system chamber like an aligner according to claim 5 and this opening is opened and closed by the shutter (98a), the interior of said conveyance system chamber can decide to consist of inert gas replaceable.
[0016] In this case, like an aligner according to claim 6, it is divided in two or more space where the building envelope of said conveyance system chamber includes the 1st inert-gas-replacement room (68B) in which said buffer unit was held, and said 1st inert-gas-replacement room can decide to be made positive pressure to said conveyance system chamber exterior.
[0017] While setting to an aligner given in above-mentioned claim 4 and holding said body of an aligner and remaining parts of said substrate transfer system like an aligner according to claim 7, when the interior is further equipped with the body chamber (14) permuted with inert gas, the interior of said conveyance system chamber can decide to consist of inert gas replaceable.
[0018] In this case, it can be supposed like an aligner according to claim 8 that said inert-gas-replacement rooms by which the building envelope of said conveyance system chamber is divided at two or more inert-gas-replacement rooms including the 1st inert-gas-replacement room (68B) in which said buffer unit was held, and adjoins mutually are constituted possible [a free passage] through opening which can be opened and closed with a shutter.
[0019] In this case, like an aligner according to claim 9, the internal pressure of two or more of said inert-gas-replacement rooms has the 2nd highest inert-gas-replacement room (68A) that adjoins said body chamber, and said 1st inert-gas-replacement room (68B) can presuppose that it is maintained lowest.
[0020] In each aligner given in above-mentioned claims 8 and 9, like an aligner according to claim 10, the concentration of the inert gas of two or more of said inert-gas-replacement rooms has the 2nd highest inert-gas-replacement room that adjoins said body chamber, and it is desirable to maintain said 1st inert-gas-replacement room lowest.
[0021] In this case, the opening area at the time of receipts and payments of a substrate of opening prepared between the inert-gas-replacement rooms which adjoin mutual [said] like an aligner according to claim 11 has the smallest opening between the inert-gas-replacement rooms contiguous to said 1st inert-gas-replacement room, and suppose that it is set up so that opening between the inert-gas-replacement rooms contiguous to said 2nd inert-gas-replacement room may become the largest. A setup of the opening area at the time of receipts and payments of the substrate in each opening here By setting up the area of each opening itself by considering as the area of respectively a request, making all openings into the same area, and adjusting the opening of the shutter which opens and closes each opening in the case of receipts and payments of a substrate It is good also as setting the opening area of each opening as a desired value, respectively.
[0022] Suppose that opening (12b) by which the opening area at the time of receipts and payments of a substrate is set to the wall which divides said 1st interior of an inert-gas-replacement room and the exterior of said conveyance system chamber like an aligner according to claim 12 in an aligner given in above-mentioned claim 11 still smaller is prepared.
[0023]
[Embodiment of the Invention] Hereafter, 1 operation gestalt of this invention is explained based on drawing 1 - drawing 3 .
[0024] The cross-sectional view (flat-surface sectional view) of the aligner 10 concerning 1 operation gestalt is roughly shown in drawing 1 considering the substrate transfer system as a core. This aligner 10 is connected to the coater developer (it is sketched as "C/D" below) 200 as a substrate processor through the in-line interface section 22 (in-line connection). In addition, it is also possible to connect C/D200 and an aligner 10 with in-line one through the in-line interface section.
[0025] This aligner 10 is equipped with the conveyance system chamber 12 installed in the clean room,

and the body chamber 14 adjoined and installed in the +Y side (on [in drawing 1]) of this conveyance system chamber 12. In the conveyance system chamber 12, most wafer loader systems 100 as a substrate transfer system are contained, and the body 21 (the configuration of those other than the wafer stage WST and projection optics PL is an illustration abbreviation) of an aligner which imprints the pattern of the reticle (un-illustrating) as a mask to the wafer W as a substrate laid on the wafer stage WST as a substrate stage through projection optics PL is contained in the body chamber 14. As a body 21 of an aligner, the body of an aligner of the projection aligner of the serial migration mold which carries out a sequential imprint to two or more shot fields on a wafer is used, for example through projection optics PL in the pattern of a reticle by step-and-repeat method or step - and - scanning method.

[0026] With this operation gestalt, the ArF excimer laser which oscillates the pulse laser light of an ultraviolet area with a wavelength of 193nm as an example is used as the light source for exposure of the body 21 of an aligner. In addition, it is also possible to use F2 laser (output wavelength of 157nm) which outputs the ultraviolet pulsed light of short wavelength from the KrF excimer laser whose output wavelength is 248nm as the light source for exposure, or ArF excimer laser.

[0027] When using the light (it is hereafter called "vacuum-ultraviolet light") which belongs to a vacuum ultraviolet area with a wavelength of 200nm or less as illumination light for exposure like this operation gestalt, vacuum-ultraviolet light Since it is greatly absorbed with extinction matter (impurity), such as oxygen which exists in usual atmospheric air, a steam, hydrocarbon system gas, the organic substance (carbon dioxide etc.), and a halogenide, In order to prevent attenuation of the illumination light for exposure, it is desirable to hold down the concentration in the gas of these extinction matter to 10 ppm - about 100 ppm or less on the average on the optical path of the illumination light for exposure. With this operation gestalt, then, the gas on the optical path of the illumination light for exposure in the body chamber 14 The gas which the illumination light for exposure penetrates, i.e., nitrogen (N2) gas, helium (helium), To illumination light for exposure, such as rare gas which consists of neon (Ne), an argon (Ar), a krypton (Kr), a xenon (Xe), or a radon (Rn), with high permeability, while it is chemically stable It permutes with the gas (it is also hereafter called "purge gas") from which the extinction matter was removed highly. Nitrogen gas and rare gas are summarized to below, and it is also called inert gas to it.

[0028] In addition, the concentration (or the allowed value) of the extinction matter (impurity) may be changed according to the class of extinction matter which exists on the optical path of the illumination light for exposure, for example, may manage the concentration of the extinction matter of an organic system most severely as about 1-10 ppm or less, and may make the concentration loose at the order of a steam and other matter following it.

[0029] Here, the wavelength of about 150nm can use nitrogen gas also in a vacuum ultraviolet area as a gas (purge gas) which the illumination light for exposure penetrates. Moreover, although it is more desirable than viewpoints, such as the stability of a refractive index, and high thermal conductivity, in rare gas to use gaseous helium, since it is expensive, gaseous helium may use other rare gas, when thinking operation cost etc. as important. So, with this operation gestalt, nitrogen gas shall be used as purge gas in consideration of the wavelength of the illumination light for exposure being 193nm.

[0030] In addition, you may make it as purge gas, it not only to supply the gas of a single class, but supply the mixture of gas like the gas which mixed nitrogen gas and gaseous helium by the predetermined ratio.

[0031] Therefore, the purge gas of a high grade is supplied to above the floor level [of a clean room] to the sealed cabin in which the projection optics PL which constitutes the body of an aligner in the body chamber 14, an illumination-light study system, etc. are held, and two or more sealed cabins in the conveyance system chamber 12 (about this, it mentions later), and the gas feeder (illustration abbreviation) for collecting and reusing the gas which flowed those sealed cabins is installed in it. Furthermore, with this operation gestalt, the gas same also to the optical path of the measurement beam of the laser interferometer which measures the location of the wafer stage WST etc. as the purge gas is supplied.

[0032] moreover, even if it is the same extinction matter, the concentration in the sealed cabin in which the concentration (upper limit) may be changed in two or more sealed cabins, for example, projection optics PL and an illumination-light study system are held may be managed most severely (the concentration becomes low — as), and the concentration may be managed comparatively loosely (it becomes high — as) in other sealed cabins. When preparing the stage room which holds the wafer stage WST succeedingly in other sealed cabins, for example, the building envelope of the body chamber 14, for a

part of purge gas [at least] supplied to one [at least] sealed cabin of projection optics PL and an illumination-light study system at this time, you may constitute so that the building envelope of this stage room etc. may be supplied. Furthermore, when the concentration of the extinction matter exceeds that upper limit by this configuration in other sealed cabins arranged at the downstream, the chemical filter which removes the extinction matter from purge gas may be prepared before other sealed cabins.
[0033] Said conveyance system chamber 12 is a division chamber made into the upper chamber and the lower chamber 2 ****s in fact, and most wafer loader systems 100 are held in the lower chamber. In addition, about the aligner equipped with such a division chamber, it is indicated by JP,7-240366,A etc. at the detail, for example.
[0034] Moreover, the conveyance system chamber 12 interior is divided into two or more space with the bridgewall, as shown in drawing 1 . Let 1st space 68B located in the -X side among two or more of such space be a load lock chamber as 1st inert-gas-replacement room where the in-line interface section 22 was connected to the -X side. Hereafter, this 1st space is called load-lock-chamber 68B.
[0035] Let the 2nd big space of the center located in the +X side of this load-lock-chamber 68B be a loader room as 2nd [which holds most wafer loader systems 100 in that interior] inert-gas-replacement room which is the sealed cabin of an airtight condition mostly. Hereafter, the 2nd space is called loader room 68A.
[0036] Let 3rd space 68C located in the +X side of this loader room 68A be the robot room in which the level articulated robot 92 which mentions later inside was held. Hereafter, this 3rd space is called robot room 68C.
[0037] Said load-lock-chamber 68B is divided with loader room 68A with the bridgewall (septum) 101. Opening 101a which carried out the configuration with a stage as shown in drawing 2 is formed in the location of the predetermined height of a bridgewall 101. This opening 101a is opened and closed by shutter 98b slid in the vertical direction. Closing motion of this shutter 98b is controlled by the non-illustrated conveyance system control system.
[0038] The septum by the side of -X of load-lock-chamber 68B is formed with the side attachment wall by the side of -X of the conveyance system chamber 12. Opening 12b of the same configuration with a stage as opening 101a is formed in the location which counters mostly opening 101a mentioned above at the side attachment wall by the side of -X of this conveyance system chamber 12. Although it, on the whole, has the same configuration as opening 101a, the height dimension (refer to dimension H shown in drawing 2) of the Johan section is small set up compared with opening 101a, opening area is also smaller than opening 101a, and this opening 12b is set up.
[0039] Opening 12b is opened and closed by shutter 98a slid in the vertical direction. Closing motion of this shutter 98a is controlled by the non-illustrated conveyance system control system.
[0040] Where opening 12b is opened wide, since the interior of the in-line interface section 22 is opened for free passage in load-lock-chamber 68B, opening 12b is also called IF opening to below.
[0041] In load-lock-chamber 68B, the repeating installation 30 which constitutes the contact surface of the in-line interface section 22 and the wafer loader system 100 is installed.
[0042] The buffer unit 29 which has a many outlines [in which predetermined spacing was separated in the vertical direction and the wafer maintenance shelves 231-236 as a shelf of the a large number stage (here six steps) which can be held were formed in it in several wafers (here six sheets) W / of U characters]-like configuration as this repeating installation 30 is shown in the perspective view of drawing 3 , It was installed under this buffer unit 29, and has vertical-movement equipment 25 which drives the buffer unit 29 by predetermined stroke in the vertical direction through a driving shaft (vertical-movement shaft) 27.
[0043] The buffer unit 29 has composition which can be inserted from any direction of +X side and (opening 98b side) the -X side (IF opening 12b side) in the arm 34 etc. so that drawing 3 may also show. That is, both carrying in and taking out of a wafer by the interface section robot of the arm 34 of the robot 32 which mentions later and un-illustrating which constitute the wafer loader system 100 have possible composition.
[0044] Since the location of opening is immobilization in a configuration of carrying in or taking out a wafer in the buffer unit 29 through opening, in order to access the wafer maintenance shelves 231-236 of all the stages of the buffer unit 29 like this operation gestalt, it is important that the buffer unit 29 moves up and down. In addition, if the wafer loader system consists of these operation gestalten possible

[vertical movement of a robot arm etc.] in part at least, the buffer unit 29 does not necessarily need to move up and down.
[0045] The purge gas mentioned above is supplied to the interior of return and load-lock-chamber 68B from a non-illustrated gas feeder at drawing 1 . Usually, the pressure inside this load-lock-chamber 68B is controlled by the non-illustrated purge control system to become positive pressure to the open air (gas of the in-line interface section 22 interior).
[0046] The purge gas mentioned above is supplied to the interior of said loader room 68A from a non-illustrated gas feeder. Usually, the pressure inside this loader room 68A is controlled by the non-illustrated purge control system to become higher than load-lock-chamber 68B and robot room 68C mentioned above. Moreover, the concentration (upper limit) of the impurity in the purge gas in loader room 68A is severely managed compared with load-lock-chamber 68B and robot room 68C.
[0047] In this case, the concentration (upper limit) and the pressure of an impurity in the purge gas in loader room 68A are slightly managed according to the purge control system gently from comparable as the space (when preparing a stage room independently in the body chamber 14, it is this stage indoor section space) where the wafer stage WST of the body chamber 14 interior has been arranged, or it.
[0048] Said wafer loader system 100 equips the part of the body chamber 14 approach in loader room 68A of the conveyance system chamber 12 with the 1st and 2nd X guide 16 and 18 which separates predetermined spacing to Y shaft orientations, and is prolonged in X shaft orientations (longitudinal direction in drawing 1), respectively, and the Y guide 20 which is located in this upper part (space near side in drawing 1), and is prolonged in Y shaft orientations. Among this, the 1st X guide 16 constitutes the conveyance guide for unloads, and the 2nd X guide 18 constitutes the conveyance guide for loading. The Y guide 20 is prolonged in the body chamber 14 side from the conveyance system chamber 12 side through opening 12a of the conveyance system chamber 12, and opening 14a of the body chamber 14.
[0049] said 1st X guide 16 — method ** of the X-axis of the conveyance system chamber 12 — it is mostly installed by X shaft orientations in the center section. Moreover, the slider 26 driven along with this X guide 16 with a non-illustrated linear motor etc. is laid in the top face of this 1st X guide 16, and the unload X-axis table 28 is being fixed to the top face of this slider 26.
[0050] said 2nd X guide 18 — the conveyance system chamber 12 — it is mostly installed by X shaft orientations like the 1st X guide 16 in the center section. The slider 40 driven along with this X guide 18 with a non-illustrated linear motor etc. is laid in the top face of the 2nd X guide 18, and the load X-axis turntable 42 as a rotary table is formed in the top face of this slider 40.
[0051] This load X-axis turntable 42 is arranged on the slider 40 top face, and is constituted by the driving gear which carries out the rotation drive of the substrate attaching part holding Wafer W, and this substrate attaching part. Moreover, the wafer edge sensors 48a-48c which consist of non-illustrated a light emitting device (for example, light emitting diode) and photo detectors (for example, a photodiode or a CCD line sensor etc.) are formed in -Y close-attendants side of the 2nd X guide 18. These wafer edge sensors 48a-48c are used for the outline alignment of the wafer W mentioned later.
[0052] The level many articulated robots (SCARA robot) 32 are arranged in the location which counters opening 101a mentioned above by the -X side (left-hand side in drawing 1) of said 1st X guide 16 and the 2nd X guide 18. These horizontal many articulated robots 32 (it is hereafter sketched as "a robot 32" suitably) are equipped with the arm 34 in which telescopic motion and rotation in XY side are free, and the mechanical component 36 which drives this arm 34. Access to the buffer unit 29 mentioned above is performed by this robot's 32 arm 34.
[0053] It drives to said Y guide 20 with the vertical movement and the sliding mechanism which is not illustrated containing the needle of a linear motor, and the load Y-axis arm 50 and the unload Y-axis arm 52 which move along with these Y guides 20 are prepared in it.
[0054] The load Y-axis arm 50 is movable in the predetermined range also in the vertical direction movable to the predetermined loading location (wafer delivery location) shown as a continuous line 50 from the location near the migration edge of the direction of -Y of the Y guide 20 near [which drives with non-illustrated vertical movement and a sliding mechanism, and is shown by imaginary line 50' in drawing 1] the location.
[0055] Moreover, the unload Y-axis arm 52 is more nearly movable [in the predetermined range] also in the vertical direction than the migration side of the load Y-axis arm 50 movable along a downward migration side to the unloading location shown as the continuous line near the loading location mentioned

above from the location which drives with non-illustrated vertical movement and a sliding mechanism, and is shown by imaginary line 52' in drawing 1 .
[0056] Said robot room 68C is constituted by the space by the side of +Y of the two space divided to loader room 68A with the plane view [of T characters] (seeing from top)-like bridgewall 102. Opening 102b with the horizontal die length long a little is formed in the wall by the side of -X of this robot room 68C in opening 101a and the configuration almost same in the location of the same height as opening 101a which were mentioned above. This opening 102b is opened and closed by shutter 98c which can be slid in the vertical direction (Z shaft orientations). Shutter 98c is controlled by the non-illustrated conveyance system control system.
[0057] Inside robot room 68C, the level articulated robot 32 which mentioned above in the location by the side of +X of the 1st X guide 16 and the 2nd X guide 18, and the same level articulated robot 92 are stationed. However, by this robot 92, that an arm moves up and down by predetermined stroke also has possible composition.
[0058] On the other hand, the FOUP base 104 for laying the front opening YUNIFAIDO pod (it being sketched as "FOUP" below Front Opening Unified Pod:) 106 is arranged at space (space of +X side edge section [of the conveyance system chamber 12 interior], and -Y side edge section) 68D by the side of -Y of the two space divided to loader room 68A with the bridgewall 102. FOUP106 is conveyed by PGV (hand mold conveyance vehicle) or AGV (automated guided vehicle) from the outside, is carried in through 12d of openings formed in +X side edge section of the wall by the side of -Y of the conveyance system chamber 12, and is laid on the FOUP base 104. In addition, of course, it does not matter using OHT (Over Head Transfer) even if it installs FOUP106 on the FOUP base 104 from the upper part.
[0059] FOUP106 is the same as that of the conveyance container which is a container (wafer cassette) of the closing motion mold which has the front door 108 which opening is prepared only in a front face (field by the side of +Y in drawing 1), and opens and closes this opening, for example, is indicated by JP,8-279546,A while it separates predetermined spacing in the two or more sheet vertical direction and contains a wafer in it. In this FOUP106, two or more steps, for example, 25 steps, of wafer maintenance shelves are formed.
[0060] Opening 102a is formed in bridgewall 102 part which this FOUP106 counters. It is formed in the location somewhat lower than 900mm of outlines from near 600mm of height outlines from a floor line at the bridgewall 102, applying this opening 102a.
[0061] The FOUP base 104 is being fixed to the top face of the driving shaft driven to Y shaft orientations with the sliding mechanism which is not illustrated [which was fixed to the base of a chamber 12].
[0062] In order to take out the wafer in FOUP106, it is necessary to force FOUP106 on the part of opening 102a of a bridgewall 102, and to open and close the front door 108 through this opening 102a. Therefore, with this operation gestalt, the breaker style (opener) 112 of a front door 108 is installed in the part inside robot room 68C by the side of +Y of a bridgewall 102.
[0063] While vacuum-drawing in or mechanical connecting a front door 108 and engaging with the interior of the breaker style 112, the closing motion member which is not illustrated [equipped with the device in which the key which is not illustrated / which was prepared in the front door 108 / is canceled] is contained. The closing motion approach of the front door 108 by the breaker style 112 and the same approach are indicated by above-mentioned JP,8-279546,A etc. at the detail. In the usual condition (condition that FOUP is not set), the breaker style 112 fits into opening 102a, and blockades this opening 102a so that the inside (interior of robot room 68C) of a bridgewall 102 may not be in an open condition to the exterior. With this operation gestalt, the sliding mechanism which drives the breaker style 112 and the FOUP base 104 is also controlled by the conveyance system control system which is not illustrated [which controls each part of the wafer loader system 100].
[0064] Next, actuation of the aligner 10 of this operation gestalt constituted as mentioned above is explained focusing on drawing 1 focusing on a wafer conveyance sequence.
[0065] First, the actuation in the case of the employment which exchanges a wafer between C/D200 is explained. In addition, although actuation of the following each part is performed according to control systems, such as a stage control system which controls the conveyance system control system under management of a non-illustrated main control system mentioned above, a purge control system, the wafer stage WST, and a non-illustrated reticle stage, in order to avoid complicated-ization of explanation below,

the explanation about a control system is omitted except for the case of being especially required. Moreover, the explanation about on-off actions, such as a vacuum chuck in the case of delivery of a wafer, shall also be omitted for the same reason.

[0066] a. If the non-illustrated interface robot which held first the wafer W which spreading of a resist ended in C/D200 approaches opening 12b, it will be sensed by the non-illustrated sensor and Kaisei of the shutter 98a will be carried out. And an interface robot's arm is inserted into a chamber 12 through opening 12b, and Wafer W receives in 23n (n= 1, 2, —, 6) of wafer attaching parts of the predetermined stage of the buffer unit 29 which constitutes the repeating installation 30 shown in drawing 3 from the -X side, and is passed to them. Here, height adjustment is beforehand performed for the buffer unit 29 by vertical-movement equipment 25 so that 23n of wafer maintenance shelves of the stage of the target for an interface robot to carry in Wafer W may be located a little in the IF opening 12b bottom on the occasion of this delivery. And when the arm of the interface robot holding an unexposed wafer is inserted in the interior of the buffer unit 29 through IF opening 12b, by carrying out the rise drive of the buffer unit 29 slightly by vertical-movement equipment 25, a wafer receives in 23n of wafer maintenance shelves of the predetermined stage of the buffer unit 29 from an interface robot's arm, and they are passed. Then, an interface robot's arm is evacuated in the in-line interface section 22 through IF opening 12b. Sensing of the sensor which mentioned above evacuation of this interface robot's arm closes shutter 98a.

[0067] The procedure of above-mentioned a. is repeated and two or more unexposed wafers, for example, three sheets, W are carried in, respectively on 23n of two or more steps in the buffer unit 29 of wafer maintenance shelves.

[0068] b. And after carrying in of Wafer W of the 3rd sheet is completed, purge gas is supplied to the interior of load-lock-chamber 68B, and inert gas replacement is performed. This is because multiple-times closing motion of the shutter 98a is carried out, the extinction matter (impurity) mentioned above since the open air of the in-line interface section 22 interior was mixing in load-lock-chamber 68B through IF opening 12b every whenever it is the closing motion mixes with the open air and the purity of the purge gas in load-lock-chamber 68B is lower than default value by carrying in of the above-mentioned wafer.

[0069] According to the purge control system which is not illustrated where both shutters 98a and 98b are closed, inert gas replacement in this load-lock-chamber 68B is performed by supplying purge gas in load-lock-chamber 68B, after the gas inside load-lock-chamber 68B is exhausted. And if it detects that the purity of the inert gas in purge gas became beyond a predetermined value (the concentration of an impurity below a predetermined value), and the pressure reached the predetermined value based on the output of a non-illustrated gas sensor and a pressure sensor, a purge control system will continue carrying out the flow of the purge gas by the predetermined flow rate so that the condition may be maintained after it.

[0070] c. If an arm 34 is controlled by a robot's 32 mechanical component 36 and shutter 98b is approached after that, this will be detected by the non-illustrated sensor and shutter 98b will open it. The height adjustment of the buffer unit 29 shall be completed at this time. And it is inserted under the wafer W with which the arm 34 was held by a robot's 32 mechanical component 36 through opening 101a at 23n of wafer maintenance shelves of the predetermined stage of the buffer unit 29, and by carrying out the downward drive of the buffer unit 29 slightly by vertical-movement equipment 25, from the buffer unit 29, Wafer W receives in a robot's 32 arm 34, and it is passed. The condition that the arm 34 was inserted in the buffer unit 29 interior for delivery of this wafer W is shown in drawing 1 .

[0071] d. Next, the arm 34 of the robot 32 holding Wafer W is rotated, and expanded and contracted by the mechanical component 36, and the arm 34 holding Wafer W returns in loader room 68A through opening 101a. And if detected by the sensor which evacuation of this arm 34 mentioned above, shutter 98b will close.

[0072] Then, Wafer W is conveyed to the location shown by the imaginary line W2 by the arm 34. At this time, the load X-axis turntable 42 is moving to the location shown by imaginary line 42'. Next, the rise drive of the load X-axis turntable 42 is carried out, and Wafer W is passed to the load X-axis turntable 42 from a robot's 32 arm 34.

[0073] e. Next, a slider 40 and the load X-axis turntable 42 which held Wafer W in one drive in the direction of +X, and is conveyed to the location where Wafer W is shown in drawing 1 by imaginary line W3.

[0074] f. Termination of this conveyance rotates the wafer W held through the load X-axis turntable 42 at

this load X-axis turntable 42. During rotation of this wafer W, the wafer edge sensors 48a-48c are used according to a conveyance system control system, and the eccentricity of the direction of Wafer W (the direction of a notch (or orientation flat)) and the XY two-dimensional direction over load X-axis turntable 42 based on wafer W core is detected. In addition, the concrete approach of how to calculate the direction of this wafer W and the eccentricity based on wafers is indicated by JP,10-12709,A.
[0075] Subsequently, angle of rotation of the load X-axis turntable 42 is controlled so that the direction of the notch for which it asked in the top is in agreement in the predetermined the direction of -Y, for example, direction, with a non-illustrated conveyance system control system. Moreover, according to the direction component of X of the eccentricity based on [at that time] wafers, the halt location of X directional movement of the load X-axis turntable 42 is determined, and the load X-axis turntable 42 is suspended in the location. Thus, rotation of Wafer W and the direction location gap of X are amended.
[0076] When Wafer W is conveyed to the location shown by imaginary line W3, the load Y-axis arm 50 is standing by in the location approaching the location shown by imaginary line 50' in the wafer W in the location of imaginary line W3, and the range in which it does not interfere. And it drives towards the location where the above-mentioned load Y-axis arm 50 after location gap amendment termination is shown by imaginary line 50', and the load Y-axis arm 50 is stopped in the location a wafer W core and whose core of the claw part of the load Y-axis arm 50 correspond. Thus, the direction component of Y of the above-mentioned eccentricity is amended by control of the halt location of the load Y-axis arm 50. That is, it does in this way and outline alignment of Wafer W is performed.
[0077] g. Termination of the outline alignment of the above-mentioned wafer W performs delivery of Wafer W to the load Y-axis arm 50 from the load X-axis turntable 42. Delivery of this wafer W is performed by rise (or descent of the load X-axis turntable 42) of the load Y-axis arm 50.
[0078] h. Move even to the loading position into which the load Y-axis arm 50 is shown as a continuous line from the location of imaginary line 50' of drawing 1 after delivery ending to the load Y-axis arm 50 of the above-mentioned wafer W. Thereby, Wafer W is conveyed to the location shown in drawing 1 by the imaginary line W4.
[0079] After the load Y-axis arm 50 carries out migration initiation towards a loading position, the load X-axis turntable 42 moves to the left end migration location shown by imaginary line 42' for conveyance of the following wafer.
[0080] At this time, exposure processing (alignment, exposure) of another wafer W conveyed on the wafer stage WST before it is performed on the wafer stage WST. Moreover, the unload Y-axis arm 52 is standing by near the loading position during this exposure. Moreover, the load Y-axis arm 50 holds Wafer W by the loading position, and is standing by from the unload Y-axis arm 52 in the upper location.
[0081] i. And after the imprint of the pattern of a reticle, i.e., exposure, is completed to each shot field of Wafer W on the wafer stage WST, the wafer stage WST is moved towards a loading position from the exposure termination location shown in drawing 1 , and the wafer [finishing / exposure] W is conveyed to an unloading position (namely, loading position).
[0082] After moving to the loading position of this wafer stage WST, on the wafer stage WST, the rise drive of the center pin CP is carried out, and the claw part in which the adsorption section at unload Y-axis arm 52 tip was prepared enters into the wafer bottom. And since a wafer receives in the unload Y-axis arm 52 by the downward drive of a center pin CP and it is passed, the unload of the wafer [finishing / exposure] W will be carried out by the unload Y-axis arm 52 from on the wafer stage WST.
[0083] j. Next, the unload Y-axis arm 52 holding the wafer [finishing / exposure] W moves to the location shown by imaginary line 52' in drawing 1 . Thereby, Wafer W is conveyed by the unload Y-axis arm 52 to the location shown by the imaginary line W5 from the loading position shown by the imaginary line W4.
[0084] However, when there is nothing in the location where the unload X-axis table 28 is shown as a continuous line by the unfinished one of a last sequence of operation, the unload Y-axis arm 52 stands by in the location shown as a continuous line in drawing 1 .
[0085] k. If the unload Y-axis arm 52 evacuates from a loading position, from the load Y-axis arm 50 which was standing by in the location above a loading position, Wafer W will receive in the wafer holder WH on the wafer stage WST, and it will be passed. When the center pin which supported Wafer W descends, this delivery is performed, while Wafer W receives in a center pin CP by the rise of a center pin CP prepared in the wafer holder WH on the wafer stage WST and being passed, after the load Y-axis arm 50 holding Wafer W carries out specified quantity descent. In the above-mentioned delivery, since it is

conveyance of the following wafer after the delivery of Wafer W to a center pin CP is completed, migration is started towards the location where the load Y-axis arm 50 is shown by imaginary line 50'.
[0086] On the other hand, the wafer stage WST where the unexposed wafer W was loaded is driven in the direction of +Y according to a stage control system, and is moved to the starting position (location shown in drawing 1) of an exposure sequence. Then, the exposure sequence (fine alignment, such as search alignment and EGA, exposure) over the wafer W on the wafer holder WH is started. In addition, it is [0087] which omits detailed explanation since this exposure sequence is the same as that of the usual scanning stepper. l. If the wafer [finishing / exposure / to the location shown by the imaginary line W5 on the other hand] W is conveyed, the unload Y-axis arm 52 will descend, for example (or the unload X-axis table 28 rise), and Wafer W will be passed to the unload X-axis table 28 from the unload Y-axis arm 52.
[0088] Since it is conveyance of the following wafer after this delivery is completed, the unload Y-axis arm 52 moves to a loading position, and stands by for the unload of the following wafer.
[0089] If the unload Y-axis arm 52 moves to the wafer near the opening 12a of the conveyance system chamber 12, and the location in which it does not interfere, it will move to the location where the unload X-axis table 28 is indicated to be a slider 26 by imaginary line 28' in drawing 1 in one. Thereby, Wafer W is conveyed to the location shown in drawing 1 by the imaginary line W6 from the location of an imaginary line W5.
[0090] m. If the wafer [finishing / exposure] W is conveyed to the location shown by the imaginary line W6, an arm 34 will drive by a robot's 32 mechanical component 36, and it will be inserted under the wafer W held at the unload X-axis table 28. And when the unload X-axis table 28 carries out specified quantity descent, Wafer W is passed to a robot's 32 arm 34 from the unload X-axis table 28.
[0091] n. If the arm 34 of the robot 32 holding the wafer [finishing / exposure] W is controlled by the mechanical component 36 and shutter 98b is approached after that, this will be detected by the non-illustrated sensor and shutter 98b will open it. The height adjustment of the buffer unit 29 shall be completed at this time. And an arm 34 is slightly inserted in the upper location of 23n of wafer maintenance shelves of the predetermined stage of the buffer unit 29 by a robot's 32 mechanical component 36 through opening 101a, and Wafer W is received and passed to the buffer unit 29 from a robot's 32 arm 34 by carrying out the rise drive of the buffer unit 29 slightly by vertical-movement equipment 25. Completion of this delivery moves the unload X-axis table 28 to the location shown as a continuous line in drawing 1 .
[0092] Next, it is rotated, and expanded and contracted by the mechanical component 36, and a robot's 32 arm 34 returns in loader room 68A through opening 101a. And if detected by the sensor which evacuation of this arm 34 mentioned above, shutter 98b will close.
[0093] On the other hand, taking out from the buffer unit 29 of the wafer [finishing / exposure] W is performed as follows.
[0094] o. A check of closing of the evacuation from load-lock-chamber 68B of an arm 34 and shutter 98b notifies that to a C/D200 side from a conveyance system control system after carrying in of the wafer [finishing / the exposure to the above-mentioned buffer unit 29] W. Thereby, if the arm of a non-illustrated interface robot approaches IF opening 12b, it will be sensed by the non-illustrated sensor and Kaisei of the shutter 98a will be carried out. At this time, the height of the buffer unit 29 shall be set as desired height. And an interface robot's arm is inserted under the wafer W held through opening 12b at 23n of wafer maintenance shelves of the predetermined stage of the buffer unit 29. And when the buffer unit 29 descends slightly, the wafer [finishing / exposure] W is received and passed to an interface robot's arm from the buffer unit 29. Then, the arm of the interface robot holding the wafer [finishing / exposure] W conveys return and its wafer W toward C/D200 through IF opening 12b in the in-line interface section 22. If the sensor which mentioned above evacuation of the above-mentioned interface robot's arm senses at this time, shutter 98a will be closed.
[0095] In the above procedures, employment which exchanges a wafer between C/D200 is performed.
[0096] Next, actuation of employment in the case of keeping and carrying a wafer by FOUP and using it is explained briefly.
[0097] Here, the condition that the front door 108 of FOUP106 is opened wide is explained as a premise for simplification of explanation.
[0098] First, an arm is rotated, and expanded and contracted by a robot's 92 mechanical component, a robot's 92 arm is inserted in the bottom of the wafer of the purpose in FOUP106, and it goes up slightly.

Thereby, Wafer W is received and passed to a robot's 92 arm from FOUP106. Subsequently, a robot's 92 arm is controlled and Wafer W is taken out out of FOUP106.
[0099] Subsequently, if the arm of the robot 92 holding the unexposed wafer W is rotated, and expanded and contracted and shutter 98c is approached, this will be detected by the non-illustrated sensor and shutter 98c will open it. The height adjustment of a robot's 92 arm shall be ended at this time. And an arm is moved by a robot's 92 mechanical component and Wafer W is conveyed by this arm to the location shown by the imaginary line W7 in drawing 1 through opening 102b. At this time, the load X-axis turntable 42 shall move to the right end migration location shown by imaginary line 42″ in drawing 1 .
[0100] Next, the rise drive of the load X-axis turntable 42 is carried out, and Wafer W is passed to the load X-axis turntable 42 from a robot's 32 arm 34.
[0101] It is rotated, and expanded and contracted by the mechanical component, and a robot's 92 arm returns in robot room 68C through opening 101a after completion of the above-mentioned delivery. And if detected by the sensor which evacuation of this arm mentioned above, shutter 98c will close.
[0102] Then, the same conveyance operating sequence as e-I mentioned above (in the case of the in-line connection with C/D200) is performed, and the wafer [finishing / exposure] W is conveyed to the location shown by the imaginary line W8 in drawing 1 .
[0103] If it is based on directions of a conveyance system control system, and an arm is rotated, and expanded and contracted by a robot's 92 mechanical component, when Wafer W is conveyed to the location shown by the imaginary line W8, and shutter 98c is approached, this will be detected by the non-illustrated sensor and shutter 98c will open it. The height adjustment of a robot's 92 arm shall be ended at this time. And arm control is carried out by a robot's 92 mechanical component, and it is inserted under the wafer W held at the unload X-axis table 28 which is in the location of imaginary line 28″ through opening 102b. And when the unload X-axis table 28 carries out specified quantity descent, the wafer [finishing / exposure] W is transferred to a robot's 92 arm from the unload X-axis table 28.
Subsequently, a robot's 32 arm 34 is carried in to the predetermined maintenance shelf in FOUP106 shown by the imaginary line W9 from telescopic motion and the location where it rotates and moves up and down and Wafer W is shown by the imaginary line W8. If the arm of the robot 92 which held Wafer W through opening 102b evacuates in robot room 68C at this time, shutter 98c will close.
[0104] Carrying in of the wafer W into above FOUP106 It specifically conveys to the height which should contain Wafer W by a robot's 92 arm. After lengthening a robot's 92 arm and inserting Wafer W up slightly [the receipt stage in FOUP106], a robot's 92 arm is dropped and it is carried out by contracting the arm of delivery and a robot 92 to the maintenance shelf of a receipt stage, and evacuating Wafer W out of FOUP106.
[0105] When it carries out by having repeated conveyance of such a wafer and an exposure processing sequence about all the wafers in FOUP106 and all processings of the wafer in FOUP106 are completed, the front door 108 of FOUP106 is moved by the breaker style 120 in a path contrary to a front, and door closing actuation is performed. The FOUP base 104 is slid to the -Y side after termination of this door closing actuation, and it stands by for conveyance of FOUP106 by PGV, AGV, OHT, etc.
[0106] As explained above, according to the aligner 10 concerning this operation gestalt, it has the buffer unit 29 which can be held in several multi-sheet coincidence for the wafer (wafer [finishing / exposure]) returned to the wafer (unexposed wafer) and C/D200 to which the repeating installation 30 which constitutes a contact with the in-line interface section 22 is carried in through an interface robot from C/D200. for this reason — even if a difference arises in a throughput between the C/D200, i.e., in-line interface section 22 and body 21 side of an aligner, — coincidence — many — it is able to make it by storing several wafers temporarily to the buffer unit 29 for there to be no loss of the latency time, i.e., time amount. For example, although the direction of the rate at which a wafer [finishing / exposure] is carried in to a buffer unit from the body 21 of an aligner compared with the rate at which a wafer [finishing / exposure] is taken out from the buffer unit 29 at a C/D200 side becomes quick when the throughput by the side of the body 21 of an aligner is higher By holding a wafer [finishing / exposure to the buffer unit 29] in two or more sheet coincidence, there is no latency time, and by the wafer loader system 100, an unexposed wafer can be taken out from the buffer unit 29, and it can carry in to the wafer stage WST. Therefore, the throughput can be raised in case a wafer is conveyed between C/D200 connected with in-line one.
[0107] Moreover, the buffer unit 29 separates predetermined spacing for the wafer for every large number

in the vertical direction, and has the multistage (for example, six steps) wafer maintenance shelves 231-236 which can be held, and drives them in the vertical direction with a drive 25. For this reason, it can insert caudad slightly and an unexposed wafer can be delivered to a robot's 32 arm 34 from the buffer unit 29 only by [of 23n of wafer maintenance shelves which set a robot's 32 arm 34 as the purpose of the buffer unit 29] carrying out the downward drive of the buffer unit 29 slightly with a drive 25. A wafer [finishing / arm / 34 / of the robot 32 which held the wafer / finishing / exposure / on the other hand / exposure to the buffer unit 29 from a robot's 32 arm 34 / only in inserting up slightly and only carrying out / of 23n of the target wafer maintenance shelves / the rise drive of the buffer unit 29 slightly with a drive 25] can be delivered. Carrying in of the wafer into the buffer unit 29 by the interface robot and taking out can be performed similarly.

[0108] And with the configuration with which a buffer unit 29 like this operation gestalt can move up and down, access by a robot's 32 arm 34 and an interface robot's arm is realizable for the wafer maintenance shelves 231-236 of all the stages of the buffer unit 29 convenient through IF opening 12b or opening 101a.

[0109] Moreover, in the aligner 10 of this operation gestalt, the repeating installation 30 containing the buffer unit 29 is arranged in replaceable load-lock-chamber 68B with inert gas (purge gas) in an internal gas, IF opening 12b for receipts and payments of the wafer conveyed between C/D200 and the buffer unit 29 is prepared in the conveyance system chamber 12 which constitutes the side attachment wall by the side of one of this load-lock-chamber 68B, and this opening 12b has become it with the configuration which can be opened and closed by shutter 98a. For this reason, after opening shutter 98a and carrying in an unexposed wafer to the buffer unit 29 through opening 12b by the conveyance system by the side of in-line one (interface robot), By closing shutter 98a and carrying out inert gas replacement of the gas inside load-lock-chamber 68B to inert gas (purge gas) Extinction matter (impurity), such as oxygen which mentioned above the gas environment around the buffer unit 29, a steam, hydrocarbon system gas, the organic substance (carbon dioxide etc.), and a halogenide, can be set as the hardly included environment. Therefore, by opening shutter 98b by the side of loader room 68A, by a robot's 32 arm 34, even if it takes out a wafer from the buffer unit 29 and carries in to loader room 68A, the extinction matter mixes in loader room 68A with the wafer, and most content concentration of the extinction matter in the purge gas in loader room 68A is not made to increase after that. Therefore, the chemical air cleanliness class in loader room 68A hardly falls in the case of carrying in of a wafer.

[0110] Moreover, in the usual condition, since load-lock-chamber 68B is made into positive pressure to the conveyance system chamber 12 exterior, it can prevent that air (open air) flows from the in-line interface section 22.

[0111] Similarly, since robot room 68C is made into positive pressure to the conveyance system chamber 12 exterior, it can prevent that the open air flows from the conveyance system chamber 12 exterior.

[0112] Moreover, it is divided in two or more space containing load-lock-chamber 68B in which the repeating installation 30 with which the building envelope of the conveyance system chamber 12 contains the buffer unit 29 was held. The internal pressure of two or more inert-gas-replacement rooms of those space, i.e., load-lock-chamber 68B, loader room 68A, and robot room 68C Loader room 68A which adjoins the body chamber 14 is the highest, and load-lock-chamber 68B which the open air may mix from the conveyance system chamber 12 exterior is maintained lowest. For this reason, it is prevented effectively that the gas inside load-lock-chamber 68B and the gas inside robot room 68C mix in loader room 68A. The concentration of the inert gas inside loader room 68A which adjoins the body chamber 14 in which the wafer stage WST is held in the interior and the illumination-light way of the illumination light for exposure is especially formed with this operation gestalt is the highest, and since the concentration of the inert gas inside load-lock-chamber 68B with an opportunity to meet with the open air is maintained lowest, the effectiveness of setting up the internal pressure of each inert-gas-replacement room as mentioned above is large. It is because inflow inhibition of the purge gas from an inert-gas-replacement room to the inert-gas-replacement room where concentration management is loose (the threshold limit value of the extinction matter is high) and where concentration management is severe (the threshold limit value of the extinction matter is low) can be aimed at by this.

[0113] Moreover, in the aligner 10 of this operation gestalt, it is set as the order of opening 102b between opening 101a between IF opening 12b between the in-line interface section 22 and load-lock-chamber 68B, and load-lock-chamber 68B and loader room 68A, and robot room 68C and loader room 68A so that

the opening area may become large in order. At the time of Kaisei of shutter 98a, by load-lock-chamber 68B connected with the gas (open air) of the in-line interface section 22 interior, since purge gas flows out outside or the concentration of the extinction matter may get worse by the inflow of the open air etc. (increment), this sets up the opening area of IF opening 12b smallest so that the increment in this concentration can be controlled as much as possible. It is convenient even if robot room 68C has a large opening area of opening 101a, since the possibility of an inflow of the open air is clearly small compared with load-lock-chamber 68B.

[0114] Here, the size of the opening area of the part which actually carries out opening of the size of the opening area in each opening at the time of conveyance of a wafer poses a problem. A setup of the opening area at the time of conveyance (receipts and payments) of a wafer By setting up the area of each opening itself by considering as the area of respectively a request like this operation gestalt, making all openings into the same area, and adjusting the opening of the shutter which opens and closes each opening in the case of receipts and payments of a wafer It is good also as setting the opening area of each opening as a desired value, respectively. Moreover, although IF opening etc. shall be opened and closed with a shutter with the above-mentioned operation gestalt, this closing motion member is not restricted to a shutter, and IF opening is not restricted to a configuration with a stage, either.

[0115] Moreover, according to the aligner 10 of this operation gestalt, they are two or more sheets (in the above-mentioned explanation) in the buffer unit 29. For example, where three wafers are held, since purge gas permutes the internal gas of load-lock-chamber 68B Since the count of closing motion and the counts of inert gas replacement, such as shutter 98a, become fewer compared with the case where hold a wafer in an one-sheet one-sheet buffer, and a gas purge is performed, also in this point, improvement in the throughput about conveyance of a wafer is attained.

[0116] In addition, the configuration of the buffer unit 29 explained with the above-mentioned operation gestalt is an example, and that of this invention not being limited to this is natural. For example, how many steps are sufficient as the number of stages of a wafer maintenance shelf, and it should just define the number of stages of a required shelf according to the throughput of the conveyance system by the side of in-line one, and the throughput by the side of the body of an aligner.

[0117] Moreover, although the above-mentioned operation gestalt explained the case where nitrogen gas was used as purge gas to the illumination light for exposure with a wavelength of 193nm, as for nitrogen gas, wavelength comes to act as extinction matter mostly to light about 150nm or less. So, when wavelength uses the illumination light for exposure of short wavelength from the illumination light for exposure about 150nm or less, for example, F2 laser beam which is the wavelength of 157nm, and it, it is desirable to use rare gas as purge gas. In rare gas, gaseous helium is more desirable than viewpoints, such as the stability of a refractive index, and high thermal conductivity. However, it has the wrap need in a sealed cabin (subchamber) an illumination-light study system or not only the projection optics PL but the wafer stage WST and a non-illustrated reticle stage nearby small one in order to control the amount of the gaseous helium used, when using gaseous helium as purge gas, since gaseous helium is expensive. In this case, the subchamber (wafer room) in which the wafer stage was held will be connected to loader room 68A. In this case, although the internal configuration of the conveyance system chamber 12 may be the same configuration as the above-mentioned operation gestalt, it may prepare three or more sealed cabins (inert-gas-replacement room) between a wafer room and the in-line interface section 22. The inert-gas-replacement rooms which adjoin mutually in this case can be constituted possible [a free passage] like the above-mentioned operation gestalt through opening which can be opened and closed with a shutter. And the opening area at the time of receipts and payments of a wafer of opening prepared between the inert-gas-replacement rooms which adjoin mutually Opening between the inert-gas-replacement rooms which adjoin the 1st inert-gas-replacement room (equivalent to the load lock chamber of the above-mentioned operation gestalt) which adjoins the in-line interface section, and this is the smallest. It is desirable to set up so that opening between the inert-gas-replacement rooms which adjoin the 2nd inert-gas-replacement room which adjoins a wafer room, and this may become the largest.

[0118] Of course, a setup of the opening area at the time of receipts and payments of a wafer [in / in this case / each opening] By setting up the area of each opening itself by considering as the area of respectively a request, making all openings into the same area, and adjusting the opening of the shutter which opens and closes each opening in the case of receipts and payments of a substrate It is good also as setting the opening area of each opening as a desired value, respectively. Moreover, it is desirable to

make the smallest opening area at the time of receipts and payments of the wafer of opening which is equivalent to IF opening 12b of the above-mentioned operation gestalt also in this case from a viewpoint which controls the concentration fall of the inert gas by the inflow of the open air.

[0119] Moreover, the internal pressure of two or more inert-gas-replacement rooms has the 2nd highest inert-gas-replacement room that adjoins a wafer room, the 1st inert-gas-replacement room is maintained lowest, the concentration of the inert gas of two or more inert-gas-replacement rooms has the 2nd highest inert-gas-replacement room, and it is desirable to maintain the 1st inert-gas-replacement room lowest. Of course, maintain, a wafer room is in comparable as the 2nd inert-gas-replacement room or the internal pressure beyond it, and the concentration of inert gas, and its things are desirable.

[0120] In addition, although the above-mentioned operation gestalt explained the case where the interior of the conveyance system chamber 12 and the body chamber 14 was permuted by inert gas, this invention is not limited to this. That is, when using KrF excimer laser light with a wavelength of 248nm, the bright line (i line, g line) of the ultraviolet area from an extra-high pressure mercury lamp, etc. as illumination light for exposure, inert gas does not need to permute the interior of the body chamber 14 as well as the conveyance system chamber 12 interior, either. In this case, although it is not necessary to divide the space of the conveyance system chamber 12 interior into two or more space and load-lock-chamber 68B in the above-mentioned operation gestalt etc. stops existing, even if it is this case, repeating installation 30 and especially the wafer loader system 100 can be used as it is, without changing a configuration. Therefore, the throughput can be raised in case a wafer is conveyed like the above-mentioned operation gestalt between C/D connected with in-line one, even if it applies this invention to the aligner of the type which does not permute the interior of the conveyance system chamber 12 with inert gas.

[0121] However, in such a case, modification of the structure of repeating installation 30 etc. is possible. That is, the buffer unit 29 may still be immobilization by making a robot's 32 arm 34 into the structure which can move up and down. In this case, the vertical-movement device 25 becomes unnecessary. In this case, the arm 34 of extent to which a robot's 32 arm 34 can access the wafer maintenance shelf of all the stages of the buffer unit 29 needs to be vertical-movement stroked. Of course, you may be the configuration in which both of the arm 34 of the buffer unit 29 and a robot 32 can move up and down. In addition, instead of purge gas, such as nitrogen and helium, a clean dried air or air may be used chemically, and it is not necessary to divide the inside of the conveyance system chamber 12 into two or more space as a batch in this case.

[0122] Moreover, the buffer unit 29 may be a configuration which arranges horizontally, namely, stands a substrate and is held several many sheets, and in this case, after rotating 90 degrees of wafers taken out, structure 29, for example, buffer unit, of the robot according to it, the structure which can be passed to a load X-axis turntable etc. should just be used for it.

[0123] Moreover, although the case where KrF excimer laser light (248nm), ArF excimer laser light (193nm), g line (436nm), i line (365nm), F2 laser beam (157nm), etc. were used as illumination light for exposure was explained above, higher harmonics, such as not only this but copper steamy laser, an YAG laser, semiconductor laser, etc., etc. can be used as illumination light for exposure.

[0124] Moreover, in the aligner of the above-mentioned operation gestalt, projection optics may use any of a contraction system, actual size, or an expansion system, and may be any of refractive media, reflective refractive media, and a reflective system.

[0125] In addition, this invention is applicable to other aligners, such as an aligner of a pro squeak tee method besides the projection aligner of step - and - scanning method, and the projection aligner of a step-and-repeat mold.

[0126] Moreover, this invention is applicable to the aligner used for manufacture of the aligner which imprints the device pattern used for manufacture of the display not only containing the aligner for semi-conductor manufacture but a liquid crystal display component etc. on a glass plate, the aligner which imprints the device pattern used for manufacture of the thin film magnetic head on a ceramic wafer and image sensors (CCD etc.), a micro machine, a DNA chip, etc.

[0127] Moreover, in order to manufacture the reticle or mask used not only with micro devices, such as a semiconductor device, but with an optical aligner, an EUV aligner, an X-ray aligner, an electron ray aligner, etc., this invention is applicable also to the aligner which imprints a circuit pattern to a glass substrate or a silicon wafer. Generally with the aligner using DUV (far-ultraviolet) light, VUV (vacuum ultraviolet) light,

etc., a transparency mold reticle is used here, and quartz glass, the quartz glass with which the fluorine was doped, a fluorite, magnesium fluoride, or Xtal is used as a reticle substrate. Moreover, in the X-ray aligner or electron ray aligner of a pro squeak tee method, a transparency mold mask (a stencil mask, membrane mask) is used, and a silicon wafer etc. is used as a mask substrate.

[0128] A semiconductor device is manufactured through the step which performs the function and engine-performance design of a device, the step which manufactures the reticle based on this design step, the step which manufactures a wafer from a silicon ingredient, the step which imprints the pattern of a reticle to a wafer with the aligner of the operation gestalt mentioned above, a device assembly step (a dicing process, a bonding process, and a package process are included), an inspection step, etc.

[0129]

[Effect of the Invention] As explained above, in case a substrate is conveyed between the substrate processors connected with in-line one according to the aligner of this invention, it is effective in the ability to raise the throughput.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the flat-surface sectional view showing the outline configuration of the aligner concerning 1 operation gestalt.
[Drawing 2] It is drawing expanding and showing the opening 101a part prepared in the boundary section of load-lock-chamber 68B of drawing 1 , and loader room 68A.
[Drawing 3] It is the perspective view showing the repeating installation 30 of drawing 1 .
[Drawing 4] It is the explanatory view showing the conventional example.
[Description of Notations]
10 — An aligner, 12 — A conveyance system chamber, 12 b—IF opening (opening), 14 — A body chamber, 21 — The body of an aligner, 231-236 — Wafer maintenance shelf (shelf), 25 — A drive, 29 — A buffer unit, 68B — Load lock chamber (1st inert-gas-replacement room), 68A [— Opening, 102b / — Opening, 200 / — C/D (substrate processor) W / — A wafer (substrate) WST / — Wafer stage (substrate stage).] — A loader room (2nd inert-gas-replacement room), 98a, 98b, 98c — A shutter, 100 — — A wafer loader system (substrate transfer system), 101a

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[Translation done.]

* NOTICES *

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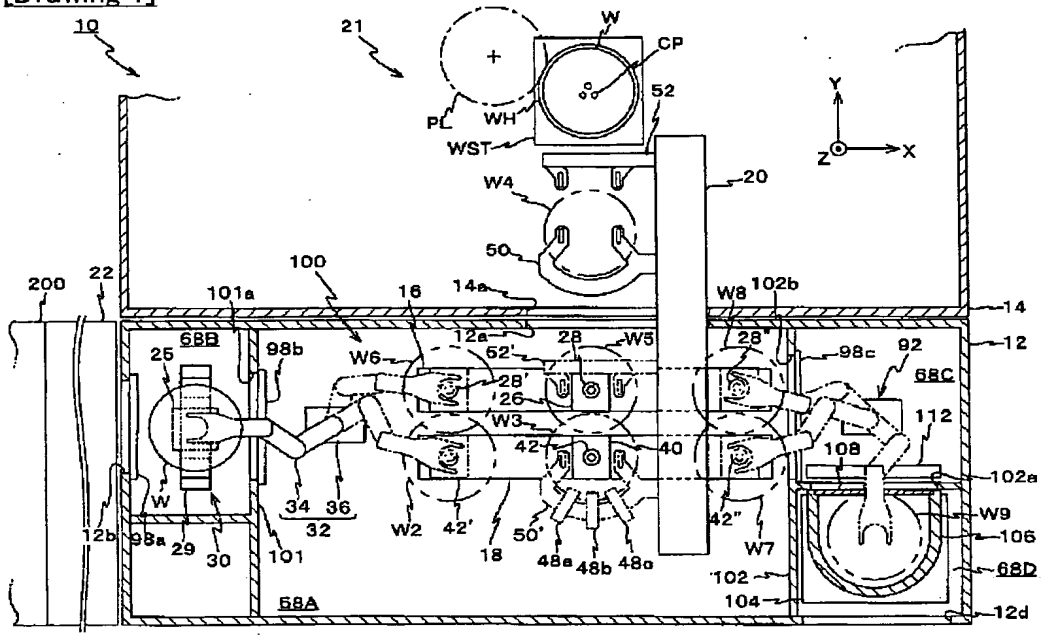
damages caused by the use of this translation.

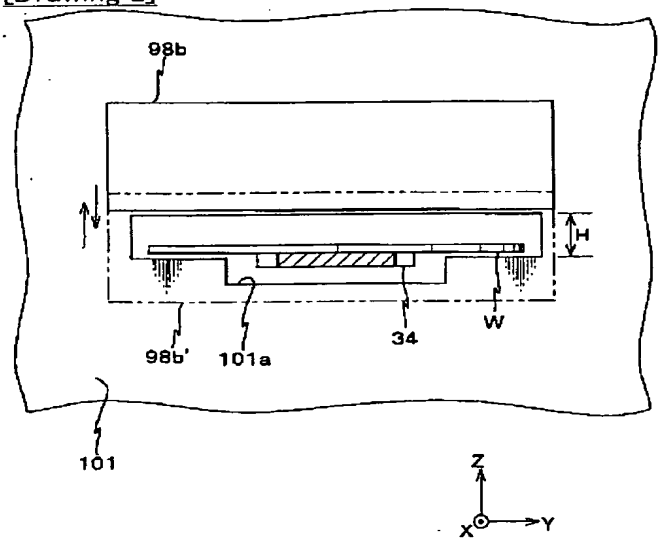
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

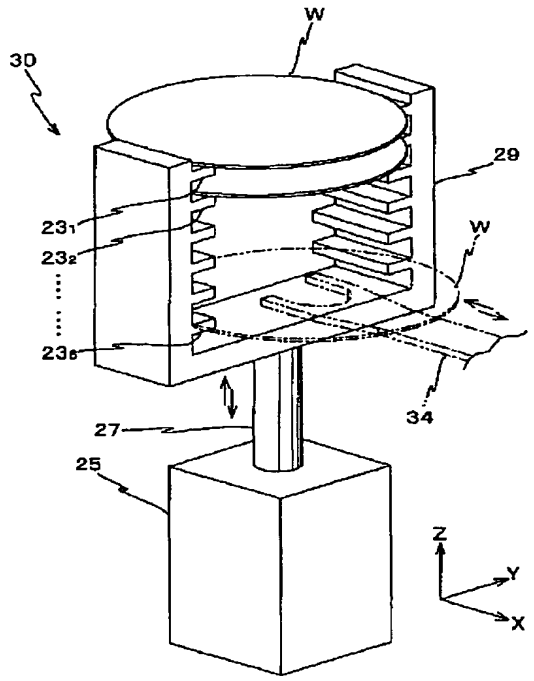
[Drawing 1]



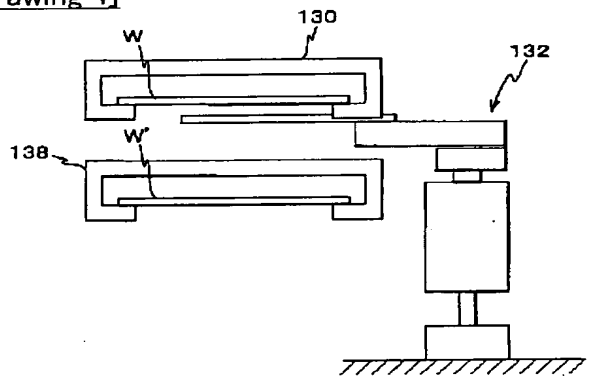
[Drawing 2]



[Drawing 3]



[Drawing 4]



[Translation done.]